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ABSTRACT

The undergraduate research-development program aims to increase students' orientation and commitment toward future research-development training and professional engagement. This paper focuses upon the instrument development training and professional engagement. This paper focuses upon the instrument development efforts in this area. Two new instruments were constructed: the Research Orientation Index (ROL) and an Omnibus Questionnaire to be used on a pretest-posttest basis. The ROI was constructed according to Likert's method of summated ratings; subjects were asked to place themselves on a 5-point continuum, ranging from strongly agree to strongly disagree. A pretest draft of a 82-item scale was administered to 204 selected education students. Their responses were submitted to a preliminary analysis, to a correlational analysis, and to a second analysis on the basis of which 25 items with the highest discriminations were selected. The Omnibus Questionnaire attempted to obtain information on biographical data; attitudes about existing undergraduate education programs at the Ohio State University, and attitudes toward research in terms of educational and occupational aspirations. (AF)

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THE DEVELOPMENT AND EVALUATION OF UNDERGRADUATE AND GRADUATE RESEARCH CURRICULA

Section III, Part IIa: Instrument Development

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The instruments and measures used in the first year of the undergraduate research-development program grew out of the program objectives and evaluation design already discussed. As you may recall, the specific objectives of the program were: (1) to provide students with a basic knowledge of the methods of scientific inquiry; (2) to foster their development of skill in the application of such methods to educational problems, and (3) to increase their orientation and commitment toward future research-development training and professional engagement. The measurement of the knowledge and application objectives employed the usual criteria of student scores above X on non-standardized achievement tests and teacher judgment of student progress. My paper focuses upon the instrument development efforts during the summer of 1967 in relation to the measurement of the orientation objective. At that time, we were unable to find any ready-made instruments which could be used to measure the variables which we had identified previously as relevant indices of research-development potential (Bargar, Okorodudu, Dworkin et al., 1967). Hence our decision to construct two new instruments -- the Research Orientation Index (ROI) and an Omnibus Questionnaire -- and to use these on a pretest-posttest basis.

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The Research Orientation Index (ROI)

The Research Orientation Index is basically a measure of attitudes toward research. The theoretical position regarding the nature and structure of attitudes is derived from Katz and Stotland (1959). An attitude is defined as an individual's tendency or predisposition to evaluate an object or the symbol of an object by attributing qualities to it which can be placed along a dimension of desirability-undesirability. The basic structure of attitude thus is suggested to be determined largely by the affective or evaluative component, although the behavioral component and at least a minimal cognitive component increases the accuracy of prediction of behavior from the expression of attitude. Specified in terms of research, the affective component refers to positive or negative feelings associated with research, which feelings are subject to arousal by the presentation of statements or situations related to research. The behavioral component contains positive or negative action tendencies toward research. The cognitive component contains beliefs about research, such beliefs tending in general to reinforce one's attitudes concerning research.

The Research Orientation Index was constructed according to Likert's method of summated ratings (1932). According to this procedure, subjects are asked to place themselves on a five-point continuum, ranging from strongly agree to agree, uncertain, disagree, and strongly disagree. The five points are weighted 5 - 4 - 3 - 2 - 1 in the case of favorable statements and 1-, 2-, 3-, 4-, 5-, in the case of unfavorable statements. Subjects respond to each item on the basis of the extent to which they are willing to endorse the item. Systematic variation in the subjects' reaction to the items of the scale are attributed to individual differences in the subjects, rather than differences in the items in terms of designated attributes.

The first step in the construction of the scale consisted of the collection of a series of 116 attitude statements from the literature on research or scientific inquiry in general and from individuals asked to express their opinions concerning research and research-related activities. As a second step, these statements were edited and checked for content validity by project staff according to standard procedures (Edwards, 1957). Finally, the statements were checked independently by three members of the staff to determine inter-judge agreement on whether each item expressed a clear-cut favorable or unfavorable attitude toward research. Items which showed disagreement between the judges were deleted. Eighty-two items, half favorable and half unfavorable were retained finally by this procedure. The third step consisted of a randomized ordering and printing of the 82-item scale, each item supplied with numbers corresponding to the five possible responses.

During Spetember and October 1967, the pretest draft of the scale was administered to a total of 204 selected education students at the Ohio State University, from a broad range of areas generally representative of potential research and non-research orientations.

The directions were as follows: "The following are statements concerning attitudes toward several issues. Please indicate your agreement or disagreement with each statement by checking the answer that best describes how you personally feel, regardless of whether other people may agree or disagree with you. There are no right or wrong answers. The best answer is your honest, frank opinion. Do not look back and forth through the statements or try to remember how you checked similar items. Make a separate and independent judgment for each statement. Do not linger over individual

statements. There is no time limit, but respond as quickly as you can, and do not leave out any of the statements." Although the respondents were given as much time as needed within the hour to complete the scale, the testing time was 20-25 minutes on the average. Each respondent's record was scored to determine the degree of endorsement of each statement. A high score was considered to be an indication of a favorable attitude, while a low score was taken as an indication of an unfavorable attitude.

In order to select items for the shortened form of the Research Scale, statistical analyses were undertaken to determine (1) the reliability or internal consistency of the scale, and (2) the discrimination of the individual statements. Plans were also made at that time for subsequent factor analyses, and tests of construct and concurrent validity.

Data from 204 respondents were submitted to a preliminary analysis. The total number of scorable items was 82, with a score of 1 - 5 obtainable on each item. Thus the over-all range of obtainable scores was 82 - 410. The scale mean and standard deviation actually obtained were 219.5 and 22.9 respectively. The reliability of the scale in terms of internal consistency was determined by Kuder-Richardson Formulas No. 3 and No. 14, each of which yielded a coefficient of .91. Correlational analysis of items was performed to obtain information concerning the merit of each item of the scale in relation to the total test score. This method of item analysis has been found to be quite comparable to t-tests of difference between a high and low group on Likert-type scales, (Edwards, 1957). A common procedure used in these analyses involves computing a Pearson r for each item with the total score minus the score for that item. The range of coefficients was -.02 to .65. Both the range of coefficients and the scale standard deviation (22.9) indicated considerable variability in

how well each individual item is a measure of what the total item pool measures.

A second analysis was carried out, using 58 items with correlation coefficients of .25 and higher with the total score for the initial pool of 82 items. The second analysis involved data from all 204 respondents on the 58 items selected on the basis of the preliminary analysis. With a score of 1 - 5 obtainable, the over-all possible range of scores was 58 - 290. The scale mean and standard deviation actually obtained were 158.2 and 19.7 respectively. Kuder Richardson Formulas No. 3 and 14 and the split-half method each yielded a reliability coefficient of .92, which indicates somewhat higher internal consistency among the 58 items. Again, a Pearson r for each item with the total score minus that item was computed for all 58 items. The range of coefficients was .20 to .65. On the basis of this second analysis, 25 items with the highest discrimination (coefficients .45 and higher) were selected for the first shortened form of the Research Orientation Index, to be used in the evaluation of the first year of the undergraduate program. Later in September 1968, a second form of the scale composed of 60 items, with coefficients of .30 or more, was constructed for the evaluation of the programs in the second year at the undergraduate and graduate levels.

The Omnibus Questionnaire

The Omnibus Questionnaire was developed to obtain the following information: (1) biographical data; (2) attitudes about the existing undergraduate education program at the Ohio State University; and (3) attitudes toward research in terms of educational and occupational aspirations. In general, this instrument reflected a variety of factors which separate descriptive studies found to be strongly related to research involvement and productivity.

In terms of biographical data, the items included measures of socio-economic factors and details of personal educational history. Attitudes toward the undergraduate program attempted to assess student perceptions and evaluation of (1) the appropriatness of coursework in education in terms of academic, intellectual, and professional interests; (2) degree of freedom for self-direction; (3) faculty-student interaction outside the context of the classroom and (4) the proportion of courses considered superior. Items relating to educational aspirations tapped the following aspects: (1) major area of specialization in graduate or professional school; (2) delayed versus immediate entry to graduate or professional school; (3) full-time versus part-time study in graduate or professional school; and (4) highest level degree realistically sought. In terms of occupational aspirations, the items included participation in primarily research versus non-research roles in education as well as participation in specific research-development activities.

Many of the items of the questionnaire pertaining to undergraduate education, educational and occupational aspirations, were constructed as Likert-type scales. Moreover, within each of the foregoing areas, items were weighted and combined to form indices.

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